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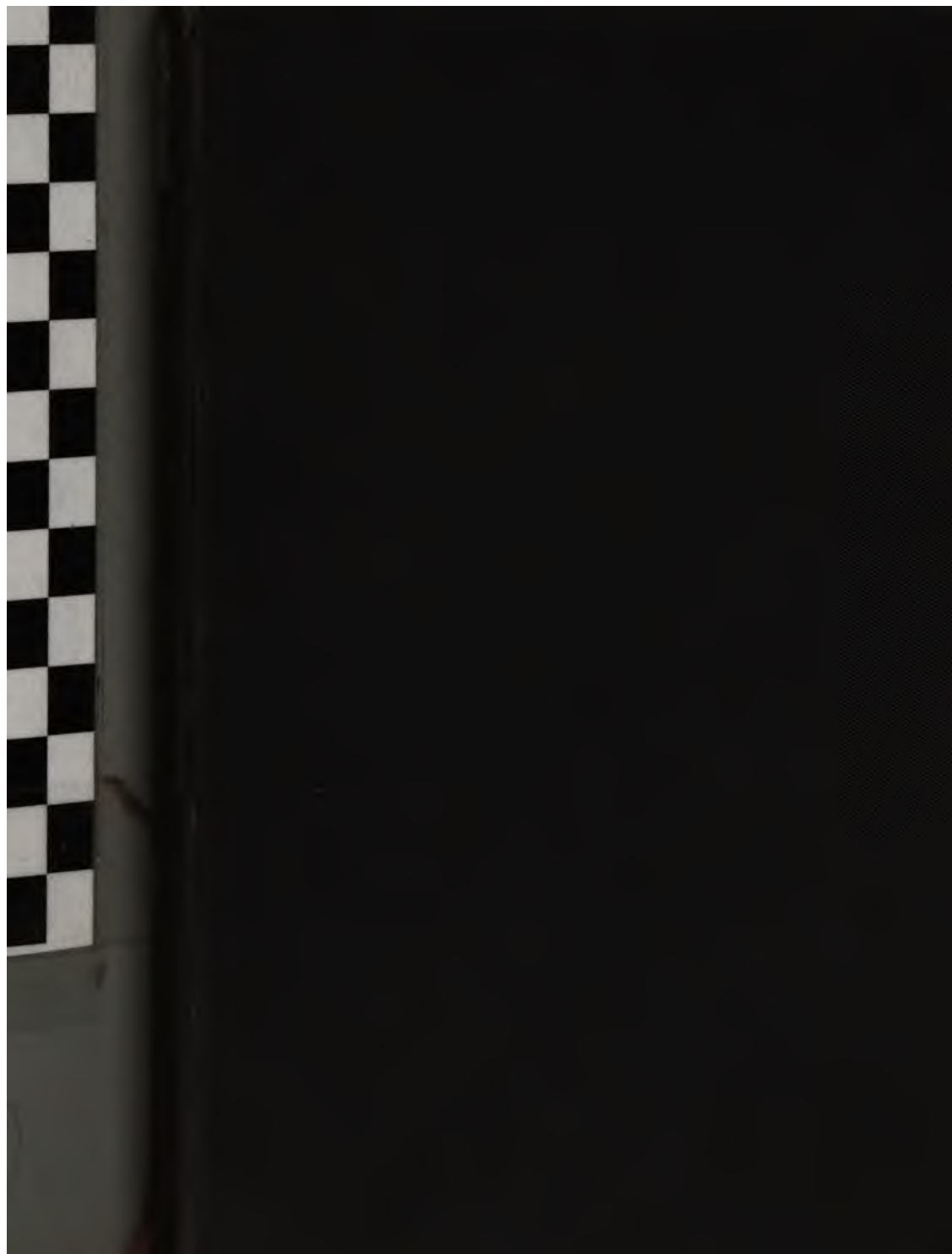
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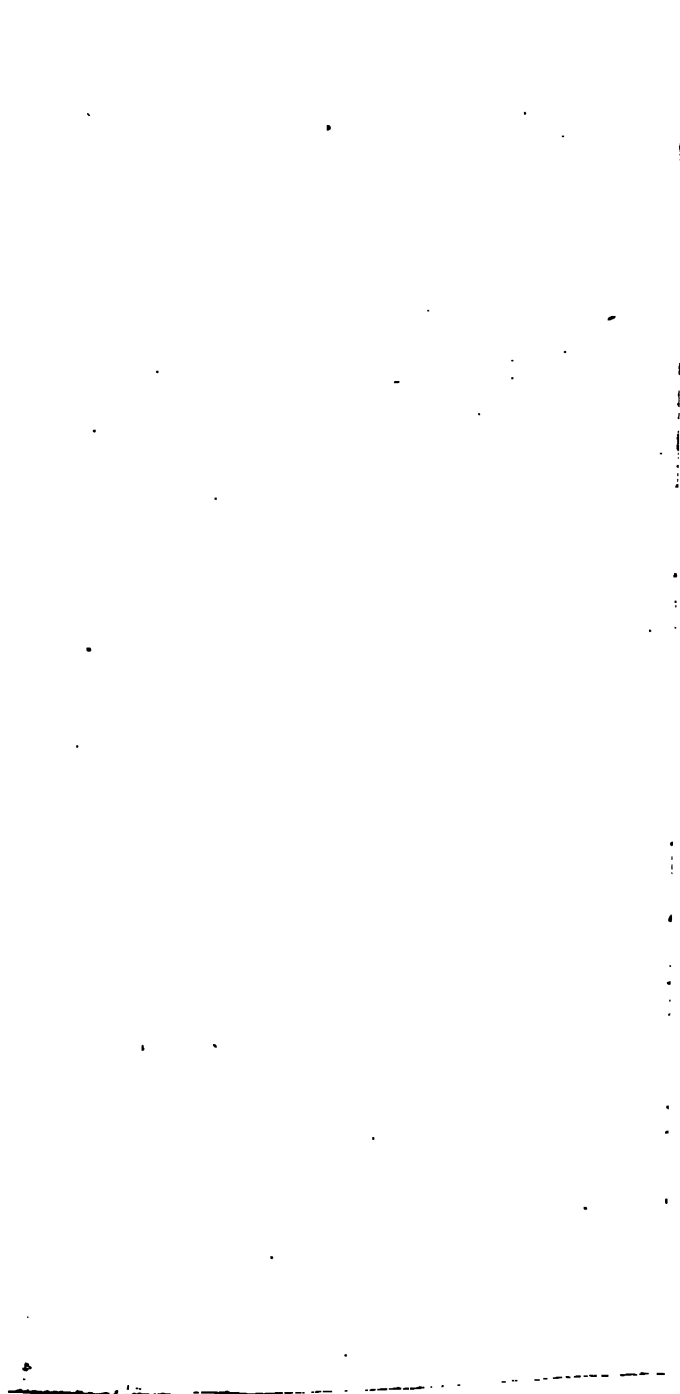
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112.

A
DISSERTATION
ON THE
INOCULATED SMALL-POX.

O R,

AN ATTEMPT towards an Investigation of the
Real Causes which render the SMALL-POX
BY INOCULATION, so much more mild and
safe, than the same Disease when produced
by the ordinary Means of INFECTION.

By JOHN MUDGE, SURGEON,
At PLYMOUTH.

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T H E

P R E F A C E.

IN the following essay I have studiously, and as much as possible, avoided all philosophical speculation; for tho' this species of reasoning may suit well enough with a luxuriant imagination, it, however, seldom enforces conviction on a strong understanding, or affords practical deductions. For

A 2 this

this reason, therefore, I have not amused myself with taking the configuration of the particles of the poisonous miasmata into consideration, nor consequently the different effects which may be produced by their being round, square, or angular; nor have I troubled myself even to enquire, whether the globules of a dissolved blood are reduced into oblate spheroids, or broke into irregular molecu^{læ}. In short, in this Disquisition I have not attempted

P R E F A C E. ▼

ed a flight upon the wings of hypothesis into the regions of uncertainty ; on the contrary, the principles upon which the inquiry is founded, are either self-evident truths, or physical maxims universally acknowledged ; and the reasoning deduced from them, such as it is, so calculated for the general understanding, that its force may be felt as well by those who have not made physics their study, as by those who have.

POPULAR

POPULAR information was indeed one great motive to this inquiry; for though the credit of inoculation is now pretty generally established, yet there are still a great number who are not altogether divested of their prejudices against it; and I am not without hopes, that the following considerations may remove their scruples, partly by informing their understandings, and partly by alarming their fears.

To

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To the medical reader I shall only say, that for the above reason, quotations from physical authorities have been intentionally avoided ; and that tho' he may possibly in this treatise meet with some things, which, unknown to me, have been before published, or which his own ideas may have suggested to him ; I am, however, willing to hope, that neither his speculative nor practical expectations will be intirely disappointed.

A D I S-



A
DISSERTATION
ON THE
INOCULATED SMALL-POX.

THERE is not perhaps a disease
to which the human race is
exposed, that differs more from
itself at different times than the natural
Small-Pox. We sometimes see this
disorder so mild and benign, as scarcely
to expose the patient to more danger
B than

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than a common cold ; and at others,,
~~exasperated~~ by a degree of malignity
and virulence, little, or perhaps not
at all, inferior to the plague itself.

INOCULATION, or the artificial method of producing it, has in a great measure stripped this formidable disease of its terrors ; and in general rendered its aspect milder, its progress more uniform, and very little hazardous to the patient ; I say in general, for we have instances, now and then, even in inoculated subjects, (though less frequent in the modern than the old method of inoculation) where this disease puts on a threatening appearance, and some few where it proves mortal.

THAT

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THAT the discovery however of the artificial method of producing the small-pox, has, notwithstanding a few examples of ill success attending it, saved the lives of thousands, and been of infinite use to mankind, is too manifest at this time of day to admit of a dispute; and these considerations have, we find, so far operated on the greater part, in spite of all those conscientious scruples ignorantly raised against this supposed innovation upon the ordinary œconomy of Providence, as to dispose them to give their sanction, and set their seal to its utility.

INDEED inoculation has been treated, and at last received by the world, as every new discovery of importance always has, and ought to be; for as

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on the one hand it would be capriciously childish, and in matters of importance dangerous, at once to embrace every novelty, or pretence to an useful discovery ; so on the other, prudence and caution become justly censurable, when carried to such lengths as to deprive us of the advantage of any mode of practice which has stood the test of time and experience.

THE difference between the natural and artificial small-pox is indeed so amazing, that one should think a mind possessed with any thirst after knowledge, could never rest satisfied from mere motives of speculation, till it had attempted an investigation of those causes which give rise to so very extraordinary a phenomenon, even supposing

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posing no practical indications could be drawn from a discovery of them: how much stronger then must the inducements to this investigation be, from the great reason there is to conclude that the most salutary effects will result from it; for inoculation, mild and little hazardous as it is, has now and then some unfavourable and untoward symptoms, of which perhaps such a discovery might enable us to divest it.

MOREOVER, if we could be assured to what causes the happy alteration made in the disease by inoculation is owing, it is more than probable we might so far avail ourselves of this knowledge, as to be able to lessen in some measure the danger of the natu-

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ral small-pox ; a confideration of the
utmost importance.

PRACTITIONERS, however, feem to
reft fatisfied with the great and ordi-
nary fuccels attending inoculation for
the fmall-pox, as it is in general prac-
tised, without inquiring into the caufes
by which it renders this terrible difor-
der not merely lefs formidable and
dangerous than it is in the natural way
of infection, but altogether mild and
gentle. Various authors indeed have
attempted to improve upon, and per-
haps fuccesfully to account for the
advantages of the modern over the old
method of inoculation ; but I do not
recollect any author who *professedly*
endeavours to inveftigate the real caufes
of that difference which has *always*
fubfifted

subsisted between the natural and inoculated small-pox, under every mode of management; and except the trite, but inadequate ones, of physical and dietetic preparation, together with the suppression of the eruptive fever by occasional exposure to cold, we seem altogether at a loss to what causes we must attribute the great and certain advantages attending inoculation; the principal of which are very few eruptions, and, except in a very few instances, an absence of the secondary fever.

DOCTOR Mead indeed, in his Discourse on the Small-pox, (p. 195.) occasionally says, “ I have often considered for what reasons it is that the inoculated is safer than the natural small-pox, and the following

B 4

“ seem

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“ seem to me to be the chief. First,
“ the venom is communicated to a
“ young, healthy, and, for the age,
“ strong body. In the next place,
“ the violence of the fever which fol-
“ lows, is prevented, if there be oc-
“ casion, by bleeding and gentle purg-
“ ing. And lastly, through the whole
“ time that the contagious matter is
“ exerting its malignity upon the
“ humours, (which is generally eight
“ or nine days) quietness, moderation
“ in diet, and every thing else, is
“ strictly observed ; whereas many
“ incur the natural disorder when the
“ blood is heated with wine and exer-
“ cise, by which means all the symp-
“ toms must necessarily prove more
“ severe and dangerous. Some have
“ also been of opinion, that the dis-
“ charge

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“ charge out of the wound made to
“ introduce the purulent matter, and
“ likewise from the small pimples
“ which break out round it, may
“ contribute something to the safety
“ of the patient. But the small quan-
“ tity which runs out this way, can-
“ not, I think, avail much.” Thus
far Dr. Mead. But, with all deference
to the opinion of so great a man, the
reasons here assigned do not satisfac-
torily account for the benign symptoms
always attending inoculation, and par-
ticularly for the essential difference be-
tween the natural and artificial disease,
arising from the almost invariable want
of the *secondary fever* in the latter.

FOR though we cannot but suppose
the causes here mentioned have a salu-
tary

tary tendency, yet that the great and constant success attending the operation does not depend upon them solely, is certain; for, besides that the same moderation in diet has been observed, and the same mercurials employed by persons, who, not chusing to submit to inoculation, and yet being almost certain of undergoing the disease from a vicinity of infection, have thought to avail themselves of such cautionary means, without producing a disease at all similar to that by inoculation; besides this, I say, persons of all ages, (after that of infancy, which by the bye is found the most improper of all) and without any preparation, or physical management, during the whole process; nay, without any particular attention to diet, have passed through
the

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the disorder with the utmost safety. How many instances might be produced (sufficiently mortifying to regular practitioners) where patients have been inoculated, or through whim or caprice have inoculated themselves, without any of those prudential precautions, and yet the event has been full as favourable as if they had been all minutely attended to, and the small-pox produced has preserved the essential characters of the artificial sort.

A few years since I had ordered a young man of twenty, of a plethoric habit, to be bled for a pain in his side, which wore off soon after the bleeding without any other medicinal assistance; nor did he pay the least attention to his
his

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his diet, but fed heartily. About a fortnight after, he called upon me to say that he supposed it would be necessary for him to take a dose or two of physic, as he had some pimples about him which were rather sore and troublesome. There was no appearance on his face or hands; but on shewing me his breast, I saw about half a dozen very large and fair pustules exactly resembling the small-pox, but so far on the decline, that the inflammation at their base was totally gone. I asked him whether he had ailed any thing, had had any complaint in his head, stomach, or back, any shiverings, or been at all feverish of late, or since his last bleeding. He told me, No. Though very certain it was the small-pox, I did not care, even then,

to

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to alarm him with the discovery; and only telling him that he need not, for the present, pay any attention to those eruptions, and that I would order some phyfic for him a day or two hence, I sent him away. Just after he was gone; my apprentice, who came with him, and was the person who had bled him, stepped back, and desired I would examine the arm in which he had been bled, for that he believed he had been inoculated by the lancet with which some variolous matter had been taken about a month or six weeks before, though he assured me at the same time that he had cautiously wiped it afterwards. The inspection of the arm converted this suspicion into certainty; for the orifice was become a scab, which had been enflamed round the edges,

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edges, with many surrounding pustular appearances; and, on inquiry, he told me that the orifice began to enflame and be troublesome some few days after bleeding.

THIS, and numberless other instances, though I hope not of the same kind, yet to the same purpose, which must have occurred to experienced practitioners, cannot fail to convince us that the great advantages of inoculation can never arise from the mere circumstances of diet or medicine.

NOR can it depend upon (what at first sight would seem probable, and has been suggested) the benign quality of the variolous matter with
which

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which the patient is infected; for though any sort of this poison will certainly produce the disease, yet general experience, and many particular experiments shew, that the *same* matter will not always produce the *same* degree of the disease. The small-pox, produced in the natural way in many persons of a family, all infected probably by one and the same patient, will nevertheless be of as many different characters, and sometimes too in the opposite extremes of mildness and malignity. And in inoculation we actually find, that be the infecting matter ever so mild, it will not equally stamp its own benign character on the disease produced by it in different subjects, but, in some few cases, be productive of a virulence that never subsisted

subsisted in itself. On the other hand, several patients have been inoculated from a confluent small-pox, which had proved mortal to its own subject, and yet have had the disorder in a very favourable way. Others have been inoculated from malignant sorts with equal success; nay, which is still more, we are told by Chandler in his essay, that in inoculating hospitals, persons have been safely infected with matter which had been taken off after the death of the patient. These, and other instances which must have occurred to men of business in this way, plainly shew that the *benignity* of the infecting matter has very little share in the wonderful effects of inoculation.

SOME

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SOME have supposed great and mysterious advantages to have arisen from using the variolous matter in a crude state, taken from the arm of the patient before it has been sublimated into a high degree of acrimony by the eruptive fever. Indeed it has been considered as Sutton's secret, and that to which his success has been principally owing. How far the superior advantages of using matter in this state have been actually confirmed by the practice of those who have recommended it, I cannot pretend to say; but from some remarkable instances which I have lately seen myself, I have great reason to believe that this mode of proceeding is a very uncertain method of infecting the patient, and therefore a hazardous refinement

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of

of the operation. Poisoning the skin, or part itself to which the virus is applied, locally, and infecting the constitution, generally, are two distinct considerations. The pocky matter applied to a scratch made on the skin of a person passed the small-pox, will repeatedly, and almost constantly, enflame the part, and raise a pimple, which will itch, smart, and be troublesome; in short, will produce an appearance similar to that which we see on the arm of an inoculated patient five or six days after inoculation. This is an experiment which I have often tried upon myself. Whenever I have inoculated a patient at a distance, whom for that reason I could not conveniently see for some days after, in order to know whether the matter applied, more.

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more especially if not quite fresh, was sufficiently active, I have usually put it to a similar scratch on my own hand, which if it was efficacious, but not otherwise, never failed to enflame, and of course informed me whether or no, on my next visit, it would be necessary to provide myself with fresh matter for my patient.

THE simple inflammation of the puncture, and the subsequent pustular appearance, are therefore no proofs that the poison reaches the constitution; nor can we ever have any assurance that it actually doth so, till it is proclaimed either by the eruptive fever, or succeeding eruptions on the general surface of the body. The instances which I above hinted at, as

having lately fallen under my notice, are an indubitable proof of this assertion. Messrs. Langworthy and Arscott, surgeons, in the spring of 1776, inoculated at Plymton, a neighbouring town, forty patients; of which number thirty were infected with crude matter from the arm of a young woman, five days after she herself had been inoculated with concocted matter, which did eventually produce in her a pretty smart fever, and a sufficient number of eruptions. The other ten were inoculated with matter of another kind, which I procured, in a concocted state, from a pustule of the natural small-pox. The arms of all the forty patients took the infection; and the latter ten, after the eruptive fever, had the small-pox in the usual way.

Of

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Of the other thirty, though the infection took place on their arms, so as to enflame them considerably, and to produce a very large prominent pustule, with matter in it, on each of them, yet not one had any eruptive fever, or a single subsequent eruption, on any part of the body; but about the eighth, in some the ninth, and in others the tenth day, the inflammation began to disappear, and about the twelfth or thirteenth the pustules on their arms scabbed off.

It is to be remarked too, that the matter which was in those pustules having been used to inoculate others, produced on them exactly the same appearances, unattended also with either fever or small-pox. Notwith-

standing the *arms* of those patients afforded the most indubitable proofs of infection, yet, as the constitutions of none of them appeared to have been infected by the supposed variculous poison, and it was therefore highly uncertain whether they were secure from future infection, it was thought right to inoculate the whole number again; accordingly five were inoculated from the natural small-pox, and twenty-five from the artificial, but all with concocted matter, taken subsequent to the eruptive fever. The result was, that every one of them had the eruptive fever, and succeeding eruptions: in short, they had the small-pox in different degrees, but all in the usual way of inoculated patients. It is very probable therefore, that the eruptive

eruptive fever is a necessary agent to subliminate the pocky matter into such a degree of virulence as is requisite to enable it to poison and infect the habit of the subject to whom it is applied; and though I do not mean to assert, that crude matter taken from the arm in the very early state of this disease, will *never* produce the small-pox; these experiments, however, are sufficiently numerous to determine decisively as to the very great uncertainty of its effects; and that, consequently, the mere inflammation and pustulary state of the arm alone, at least when produced by matter in this imperfect state, may dispose the patient to a dangerous confidence, as it is by no means a proof that he is secure from a future infection.

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BUT to return. Whatever advantages may have been ascribed to this ichorous kind of matter, certain however it is, that inoculation had been practised generally many years before this supposed secret of Mr. Sutton's was thought to be discovered, and all that time its credit had been supported by nothing but its success. I have myself been conversant with inoculation near thirty years, during the whole of which time I have constantly used the concocted matter, and yet never had the misfortune of losing more than one patient in my life, though I have inoculated a great many every successive spring and autumn. Indeed I am inclined to believe that very little advantage ever arose from this trick; and that the great, nay, the

the only superiority of the modern, or Mr. Sutton's method, over the old, consists in keeping down the eruptive fever, by a free exposure to the open air, and in being able, by means of the very slight rasure of the skin, to judge with more certainty of the patient's infection, or to form, perhaps, a more probable guess at the future disease: whereas, in the infancy of inoculation, it was natural for practitioners, till they had been better taught by experience, to transplant their maxims from the natural to the artificial disease; and, among the rest, they thought it necessary to keep their patients warm, and sometimes even in bed during the eruptive fever; for errors rooted in long custom, where reason could do but little towards the investigation

investigation of truth, could only be cured by accident and experience. "Till these last six or seven years, I followed the method generally in use, except that I always made the incision very slight, and was scarcely ever under any anxiety for a single patient : however, from the latter period, as I saw the very evident use of keeping down the eruptive fever by cool air, I have given my patients the advantage of it, and have not had a single one confined, unnecessarily, an hour, by the disorder; though, as I said before, during the whole of my practice, in the old as well as modern method, I have invariably used matter in a concocted state.

BUT,

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BUT, granting that the use of crude matter has any tendency to render the disease more favourable than in other modes of inoculation, still we may be absolutely sure that it never can account for the great and striking difference between the artificial and the natural disease ; for this plain reason, because, as we observed before, the former has always preserved its character and mildness under every mode of management, and indeed with no management at all.

It has been supposed too, that the mildness of the disease arises from the very small quantity of matter with which the constitution is poisoned in every mode of inoculation, but more particularly in the modern. This reasoning

reasoning is founded upon a supposed analogy between the operation of the *pocky virus* and that of medicine on the animal œconomy, in proportion to the quantities of each received into the constitution. Constant experience, however, shews, that this reasoning is more plausible than true, and that it by no means affords an adequate solution of the difficulty. We frequently see in an infected family, especially among the poorer sort, a number of children attacked by the disease. If the *degree* of the small-pox at all depended on the quantity of the infecting poison, those who, out of a number of children, were the last infected, would have the disorder with the greatest severity; for where they are obliged to breathe together in the same room, which is frequently

frequently the case with the poor, the latter subjects of infection must constantly have inhaled the morbid atmosphere for days together; and, agreeably to this idea, the constitution must have been as it were saturated with the variolous poison before the eruptive fever comes on. However, the fact appears otherwise; for the subjects of the disease are indiscriminately affected, and do not seem to be at all influenced by this principle. The first patient seized, whose illness may frequently arise from the slightest and most transient infection, will perhaps have a deadly small-pox; while some of the last infected, though they have been constantly breathing the exhalations from a mere mass of corruption, shall nevertheless have it
in

uniformly attends the disease by inoculation, let it be performed, or the subject managed, in whatever manner it may; even though the patient be ever so much loaded with pustules, or oppressed with the disease; and that is the general absence of the *secondary fever*, that most formidable symptom so often fatal in the natural small-pox. Indeed, if there is any one criterion by which the artificial disease is to be distinguished from the natural, I think it is this exemption; for I do not remember in my practice to have met with it in a single instance.

IN order to discover then the real cause, or causes, which render this disease so mild under *every* mode of inoculation, in almost all cases so very
different

different from the natural small-pox ; let us take a view of the latter, and see whether, by physical analogy, we can investigate the real causes of that dreadful variety it frequently affords ; for though, as we observed before, its aspect is sometimes so mild as not to exceed the inoculated sort, or even to give the patient notice of his own disease ; yet at others it is complicated with a train of symptoms so horrible and deadly, as to leave him no more chance for his life than if he was poisoned with the plague.

IF by such an inquiry, I say, we can develop the true causes of danger in the natural small-pox, we shall most probably furnish ourselves with

D principles

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principles which will enable us to account satisfactorily for the absence of them in the artificial disease, and shew the real causes of the success of inoculation.

PREVIOUS, however, to our entering on such an inquiry, it may not be amiss to observe, that on *this subject* we can draw no certain data, nor establish even a probable hypothesis, from mechanic philosophy ; simple matter and motion are almost the only proper subjects of its speculation, and consequently, it is improperly applied to any others ; particularly on medical questions, all reasoning from mere mechanical principles, however plausible it may at first appear, has at best been only a sort of ingenious

ingenious trifling, serving perhaps to amuse the mind, but never producing one practical corollary.

IN any complicated piece of mechanism, a repeating watch for instance, where nothing but matter and motion are concerned, when it happens to be out-of order, goes irregularly, or perhaps stops; the mechanic, notwithstanding a minute description of the symptoms, or all the circumstances attending the deficiency, and though he thoroughly understands its construction, or perhaps made it, is yet frequently incapable of forming a probable guess at the cause, without taking it to pieces. How then is it possible, in an animal where the organization is infinitely

complicated, and of which the groffer parts only are even pretended to be understood ; how, I say, can the phyfician, with mechanic precision, determine the caufe of any diforder which may arife in fuch a multifarious and myfterious compofition !

FURTHER ; where the fubject of difquifition is a *living animal*, compounded not only of an infinite variety of organized parts, but thofe animated, and as it were fpiritualized, by a vital principle pervading the whole, and which enters into, and is concerned in every difeafed, as well as every falutary procefs of the animal œconomy ; how much lefs poffible is it for the philofopher to eftablifh data from a principle totally beyond his cognizance,,

zance, and consequently from mere mechanic ideas, adequately to account for, or even form a rational guess at, the effects that any foreign agent may produce in it?

SUCH a subject of his inquiry is by no means adapted to the means of investigation he is furnished with; these too in themselves are very scanty and imperfect, and take in but a small compass of information. His apparatus may shew him the weight or levity of the air, its degrees of moisture or dryness, and its precise heat. He may take into the account too the direction and force of the winds, the tonic effects of north-east, or the laxative qualities of the south-west. But will any, or all of

D 3 these,

these, discover to him that mysterious specific principle in things which shall at one time epidemically favour the production of the small-pox, at another the measles; or affect one species of animals, horses, bullocks, or dogs, for instance, with one common disorder, while those of another species are totally untouched? So far from it, that if the philosopher was to reason fairly, and draw his conclusions *a priori* from the means of information he is possessed of, he would sometimes prognosticate diseases which were never brought into existence; and at others be surprized by the production of those which apparently he had not the least reason to expect.

MORTIFYING

MORTIFYING therefore as it is to the pride of reason and philosophy, we must nevertheless be contented to draw truths, I mean medical ones at least, from the records of experience and observation, which, in this respect, are the only true fountains of knowledge. It is from these alone, and from analogical reasoning deduced from them, that we can securely form conclusions to any useful or practical purpose.

UPON this ground then let us take a view of those principles by which a subject for variolous infection may be influenced or affected at the time the disease commences ; and these we shall comprehend under the four following considerations.

D 4

FIRST,

It does not appear that every taint in the constitution, or even the actual existence of what is commonly called a bad habit, is unfriendly to this disease. We frequently find, in the natural small-pox, subjects with what are usually called scorbutic foulnesses on the skin, and even very considerable stumous complaints, who nevertheless pass through the small-pox so very favourably, as not to afford the least reason for supposing that those disorders had any tendency to exasperate it. I have at this time under my care four children in one family, three of whom have been always unhealthy, and perpetually subject to boils, scabby eruptions, excoriated ears, and every other symptom of foul and depraved juices. These, however,
have

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have the natural small-pox in a very mild, favourable way; at the same time that the eldest, a very healthy and clean-constituted boy, has suffered by it to a most severe degree.

IN the artificial disease likewise experience evidently shews (whatever doubts there might have been in the infancy of inoculation) that those taints in the constitution have so little to do with the peculiarities of this disorder, that they are never any reasonable objection to inoculation; for patients in those circumstances pass through the disorder in as kindly a manner, and with as few eruptions, as those of the cleanest habit. I have inoculated a great number under scrophulous complaints and foulnesses of
the

#4 A DISSERTATION ON THE

the skin, without any inconvenience except, perhaps, a few partial pustules invading the skin round the scabby parts ; and as the seat of those disorders is usually the surface of the body, (while the subject is otherwise in health, and the nobler parts are unaffected) a few additional pustules are of no great consequence.

THE variolous poison is therefore a thing *supra generis*, and no ways affected by those taints of the juices, or what is usually called a bad habit of body ; or at least so inconsiderably, as not to deprive such patients of any of the advantages of inoculation, or now to deter experienced practitioners from performing the operation upon them.

BUT

INOCULATED SMALL-POX. 45

BUT if the subject attacked with the disease is of an athletic constitution, with strong tense fibres, and a dense blood; if he has fed high; if his vessels are full, and the first passages loaded with foul matter; and what is worse, if, when the body is poisoned by the variolous virus, the patient, before he has even notice of his disease, happens to have over-heated himself by exercise or debauch; if, I say, the inflammatory tendency in such a constitution is heightened by this ill-timed irregularity, and perhaps further increased by the preternatural heat of the bed, we cannot wonder if the variolous fever is violent, and of course productive of all the mischiefs of which an excess of it is capable. A rapid, tense pulse, short and laborious breathings,

ings, great heat and thirst, a dry and foul tongue, with violent pains in the head, back and loins, are the natural train of symptoms arising from such a state of things: and how far the degree of the eruptive fever, in this aggravated state of it, is instrumental in increasing the consequent eruption, and loading the constitution with variolous matter, I shall shew hereafter.

If, on the other hand, the constitution of the patient is under the influence of the contrary principles, either from antecedent acrimony in the blood, or some unaccountable depravity in the animal œconomy, which disposes the fluids and solids to solution and rottenness; under these circumstances,

circumstances, we may be sure that the eruptive fever, supervening upon such a state of nature, will heighten the putrescent tendency, and produce pustules of a very unfavourable kind. As this state of the constitution is the reverse of the inflammatory, (which, however, sometimes terminates in the same way) we cannot be surprised by a crude indigestible pock, petechiæ, black and livid spots and hæmorrhages, the natural consequences of a dissolved crasis of the blood.

WITHOUT descending therefore into the minutæ of other differences in constitution, or meddling with doubtful disquisitions, we shall content ourselves with having observed, that patients of either of the two last described habits

it is more than a probable
 being severely dealt with
 equally removed as
 different extremes,
 and unoppressed
 which is properly cal-
 culated for combining with, or suc-
 ceeding on the process of

SECONDLY; let us consider how
 patients under the above, or other
 influences, may be affected by the
 quantity of mischief, viz. the
more or less, or uncertain quan-
ty of venereal matter existing in the
system at the time of infection;
 or, in other words, by the *different*
 quantity there is in the body itself at
 several times to be *posseed* with the
 venereal matter.

THAT

THAT different quantities of matter are produced in different subjects in the process of the disease, we find true in fact, by constant and woful experience; and there is likewise the strongest reason to believe that, previous to infection, the quantity of the variolous matter, or rather that principle in the constitution which eventually produces it, *ebbs* and *flows*, is more or less vigorous at different times in the *same* subject under a various combination of circumstances.

WE see at one time a person exposed to all the natural means of infection: he shall visit the sick-room of people under the disease, breathe in the morbid atmosphere, or perhaps sleep in the same bed with them; and

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yet

yet all this, nay, even inoculation itself, shall not produce the disease in him. On the contrary, at another time, the very same constitution will, as it were, take fire of itself, and, without any apparent preceding cause, be infected with the distemper. And indeed the instances are by no means uncommon, where the patient who has withstood at one time all the ordinary means of infection; nay, who has industriously, but ineffectually, sought it; yet at another has had a small-pox so malignant in appearance and effect, that the whole body was converted into an offensive variolous putrescence. Indeed, were it not true that there is in the constitution itself, if the same subject, this different propensity to be poisoned; or, in other words,

words, that the constitutional principle which produces the pocky matter doth actually suffer an increase and diminution of vigour, it would be scarcely possible to conceive why, when the small-pox is epidemic, any one not passed the disease should escape. From whatever causes, however, this propensity may arise, there is great reason to suppose that the increase or decrease, the ebb or flow of this principle, may respectively take place according as the small-pox is epidemic, or not. For the very idea of an epidemic is one and the same morbid state of animal bodies produced, or at least considerably promoted, by the occasional operation of some general and external cause; and therefore, before the small-pox can rage epidemically, it must be

at least greatly encouraged by the influence of some specific principles then subsisting in the state of external nature, which operate upon, and dispose the body to infection. So that when we see the small-pox epidemic, it may with great probability be concluded, that though the disease may not actually be produced in every one that has not passed it, yet that the human constitution is then more particularly disposed to, or ripe for, the infection.

BUT whether the degrees of this variolous principle depend simply upon the state of the air, or some peculiarities in the constitution arising within itself, or are the result of a combination of both ; which ever of these
is

is supposed, there is the greatest reason to believe, if we may safely draw any conclusions from physical analogy, that the aptitude to infection in the same subject keeps pace with the several degrees of this principle; that is, when the constitution is most fraught with variolous matter, that then it is most disposed to be poisoned or infected. During the continuance of any contagious epidemic disease, we always find that those constitutions which are most congenial with that character, are peculiarly obnoxious to the correspondent distemper. Thus, in a state of air which is productive of putrid fevers, all those subjects whose solids are yielding, loose and flaccid, and where the blood has a propensity to run into a

dissolved state, are always very susceptible of infection, and easily fall into the putrid disease of the time. When the malignant fore throat raged, strong robust men, with tense fibres and dense blood, might, and did, safely expose themselves to the greatest contagion, without any risque of receiving the infection; whereas to young children, women, and even men of very delicate habits, the risque of infection was almost reduced to certainty, (on the first breaking out of the disease) if ever they inhaled the contagious atmosphere surrounding the sick.

IN whatever manner it is that the contagious particles proceeding from a diseased subject infect and so far contaminate the juices of the constitution
to

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to which they are applied, as to convert them into their own depraved nature ; or however it comes to pass that perhaps most diseases have, more or less, a tendency, in common with almost every thing else in nature, to produce their like, and propagate their being ; certain it is, however, that the operation of this principle must be in proportion to the degrees of congeniality subsisting between the agent and the subject of its influence ; and we may therefore conclude, that when the constitution of a person not passed the small-pox is most saturated with the variolous principle, he is then more particularly subject to infection.

BUT though there cannot be the least doubt that the variolous principle subsists in the constitution of persons not passed the small-pox, and it is highly probable that the vigour of this principle varies at different times in the same subject, so as eventually of itself to produce a greater or less quantity of pustules; yet I am far from thinking that no part of the variolous matter, that may make its appearance in the course of the disease, could be owing to any other cause; or that the whole of it necessarily existed in this principle *prior* to the eruptive fever, and *antecedent* to the whole variolous process. This notion, I am convinced, is not founded in truth, though it doth not want plausibility, and is indeed the foundation
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of that systematic kind of reasoning of which the physical world has been very fond, and on which the doctrine of critical periods hath been principally built. Here therefore, though it is not absolutely necessary to the present argument, yet, as it bears some relation to it, and may furnish us with important practical indications as to the actual quantity of variolous matter produced in the process of the disease, I shall beg leave to examine into the probability of this opinion.

In this view of things then, a fever is considered as a salutary agent of nature, abstractedly inoffensive in itself, and essentially necessary to convert the morbid state of the juices into a proper condition for the purposes of the animal

mal œconomy ; as a kind of chemical process, where, in analogy to the fermentation of any fluid, the agitation continues till (if the patient's strength can last out the struggle) the morbid matter being forced off in a critical disputation through some of the excretory ducts, the constitution is swept clean from the evil that poisoned it, and the animal, at the expence of great fatigue, and consequent weakness, recovers its health. The reasoning of this hypothesis, I say, proceeds upon the supposition, that the *whole* of the poison, or matter, which makes its appearance on the future critical termination of a disease, and which is so offensive to the principles of life, existed in the constitution *prior* to, and so far independent of, the fever,
that

that if the patient miscarries, he dies not of the visible fever, (which is in truth an aggregate only of external symptoms, such as rapid circulation, great heat, thirst, dry tongue, &c. none of which, abstractedly considered, have any mortal tendency) but of this internal poisoned state of the juices, which is invisible, and no way cognizable by our senses, but from the fever that it produces.

IN this manner of considering the process of an acute disease in the animal œconomy, the physician has little else to do besides occasionally restraining its violence, or exciting it in a state of languor; but, with a patient superintendence, to wait the termination of the fever, either by a salutary crisis,
or

or death. For in this state of things, any attempt towards the removal of the fever itself, or the suppression of this process, and whatever means may be proposed for this purpose, must result from the most ignorant quackery; or if they do succeed, must owe their success to principles quite foreign to this view of the matter.

BUT happily for us, we do not always *act* consistently with our speculative opinions. However fond we are of paying compliments to our own sagacity, an honest man will not sacrifice his patient to his vanity by a tenacious adherence to a favourite theory, when it doth not square with experience; but will prescribe and use for his patient any means of recovery
that

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that has had the sanction of actual success. If he can cut the disease short, and cure his patient quickly, though it is by the destruction of this febrile process, (which, upon the above principles, he ought to consider as sacred and inviolable) he will not refuse the successful aid and free use of the lancet, nor even a dose or two of James's Powder, or any other antimonial.

Now, to consider this matter a little more closely. In fevers of the putrid character, whether they owe their rise to a putrescent state of the fluids, incomprehensibly produced in a vitiated habit, or are superinduced by morbid contagion; or, by a malignant epidemic influence in the
air;

air; or by a combination of foreign circumstances; in this species of fever, I say, the above systematic doctrine is not so speciously founded: for though a previous acrimony or solution of the blood may, as it were, stimulate the vital powers of the animal into preternatural exertions, and raise a fever in order to restore the salutary state of the fluids; yet we know by experience, that the very fever itself will produce, or at least aggravate, this vitiated state of them, which, upon the present supposition, it was designed to cure; for a violent rapid circulation, and the ardent heat attending a very smart fever, will most certainly increase the disposition to putrescence; and even diseases which, in their early stages, (from the fizy state of the blood) were

were not of an inflammatory cast, yet, by the continued ardour of the fever, frequently become putrid.

HERE then we see *cause* and *effect* (as they frequently, indeed most generally, are in physical matters) so nearly allied, that supposing a pre-existing ill state of the fluids to cause the fever, yet the effect so far operates backwards upon the cause, as to increase the evil it was intended to remedy.

ACCORDINGLY, indications have been drawn from diseases of this class, for a practice of two different kinds; the one using alexipharmic or antiseptic medicines, where the physician directs his attention to the state of the fluids, as the cause of this fever; and the other

no other than the agent of nature to expel the poison.

BUT rational as, at first sight, this opinion may appear, there is great reason to believe that it is not wholly founded in truth. The small-pox, in its genuine state, is truly a disease of an inflammatory kind; and we know by experience, that as inflammation will produce fever, so fever will at least increase inflammation. In the pleurisy, peripneumony, or any other considerable inflammatory disorder, we are almost at a loss to say what is cause, or what is effect; but be that as it may, of this we are certain, that cause and effect are so intimately connected, that the latter never fails of re-acting so upon the former, as to seem almost
coeval

coeval with it. If pain and the consequent inflammation produce fever, the latter, though merely symptomatic, operates backwards immediately upon its cause, and increases the inflammation. On the other hand, if the fever is supposed to be the primary cause, as producing inflammation; yet pain, the necessary concomitant of the latter, will symptomatically increase the former. And, in consequence, we find that the successful methods of cure are equally adapted to the disease under both those considerations. For as by antiphlogistic, refrigerating medicines, and more particularly by large bleedings, the vessels of the patient are so far slackened, as to make it almost impossible for nature to form or continue an inflammation; so, at

the same time, no method of treating it can be better adapted to the cure of the fever.

IN the variolous fever likewise, we cannot be sure whether the whole of the poison which makes its appearance in the future process of the disease, existed in the constitution prior to the eruptive fever; or whether the agency of fever is not of such a nature, as if not to generate, at least considerably to increase it, by assimilating the juices of the constitution into the nature of the variolous poison. All that we can conclude upon with certainty is, that there is a variolous principle, a kind of nidus, a specific-something, existing in the constitution of a person who has not passed the small-pox, which
ceases

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ceases in one that has ; that the application of the poison to the subject sets this principle in action by the agency of fever ; (which is indeed an inseparable and essential part of the disease) but there is no more reason to conclude that the matter actually generated in the subsequent process existed independent of that fever, than there is to conclude that salt of hartshorn, as a volatile salt, existed in the horn of the stag prior to, and independent of, the agency of the fire concerned in the process of making it.

WHOEVER has been conversant with the present manner of conducting the disease under inoculation, in the way Mr. Sutton has introduced, of suppressing the eruptive fever by an ex-

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posure of the patient to the cold of the open air, cannot doubt of the fever's being a very considerable agent in the increase of the pocky matter. Indeed nothing but the strongest presumption of this from real experience could have induced practitioners to have adopted this method, which, at first sight, combated, and seemed totally inconsistent with all their systematic notions. For, besides the seeming impropriety of indiscriminately exposing to the severity of the weather all constitutions, as well the delicate as the robust, was it likely, upon the supposition of the existence of the whole variolous matter prior to the feverish alarm, that the keeping down, and, as it were, stifling this supposed agent of nature, apparently calculated
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(upon the former systematic hypothesis) for sweeping the constitution of the morbid miasmata, which would otherwise poison the blood, and all the juices secreted from it; was it likely, I say, that this should be found a successful mode of practice? or was it possible indeed that any thing but the actual and constant advantages arising from this practice could have caused it to be almost universally adopted, and disposed the world to make a sacrifice of a theory so plausible, apparently rational, and long established?

ACCORDINGLY we still find some few practitioners, and the bulk of the people in general, always urging their suspicions, that by stifling the eruptive fever, (and, in consequence, lessening

the eruption) the crisis is rendered incomplete; that the constitution is not sufficiently swept from the various poison which pre-existed in it; that we are to expect succeeding complaints, or chronic mischiefs, some time or other, resulting from a foul poisoned state of the juices. And indeed so strong are the prejudices of the world, and so difficult is it to establish a truth (even though well supported by experience) when it contradicts our favourite habitual maxims, that numbers of people are uncandid enough to ascribe every complaint or disorder in the habit of the inoculated patient, for years afterwards, merely to this circumstance, though the truth, in fact, is quite otherwise: for we scarcely ever see these mischiefs produced in the
habit

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habit by inoculation, that we do by the natural disease; such as obstinate ophthalmise, and numberless other complaints arising from a foul state of the juices. Nor, if we consider the matter speculatively, is it likely to be otherwise than it is really found. For it is not reasonable to suppose that the constitution, or animal juices, should be so much injured or depraved by so slight a disease as the inoculated small-pox almost always is, as (what we frequently see in the natural small-pox) when the whole body is converted into a general putrefaction, and a nauseous mass of corruption.

FREQUENTLY indeed the eruptive fever is so very slight under inoculation, that it is scarcely cognizable to the
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the practitioner by the pulse, or any of the usual symptoms; nay, the patient himself is hardly sensible of it: in this case the succeeding eruptions are ordinarily very slight, and the disease passes off very mildly. But if the symptoms of the eruptive fever run high, if the tendency to shiver is pretty considerable, and the head is giddy, or much oppressed; if there is great languor, listlessness, or lassitude, and aversion to motion; and if, in consequence of all this, the patient's inclination to the fire-side, or, what is worse, the bed is indulged, we find by constant experience that the fever is increased, and all the symptoms aggravated. On the contrary, when the patient under those circumstances is moved into the free air, and feels
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its refrigerating effects on his body, the feverish disorder subsides, the head is less heavy, the spirits less oppressed, and the powers of enjoyment return. This continues as long as he walks, or is carried abroad; but when the time for sleep arrives, the heat of the bed never fails to aggravate all those complaints; and, after his passing a hot and restless night, with an increased pulse, flushes in the face, and short slumbers perpetually disturbed by startings, you find your patient in the morning so stupidly heavy, oppressed, and indisposed to motion, that it is always with difficulty that he (or the by-stander, if it is a child) can be persuaded to believe it necessary he should get up, and be carried into the open air; yet, as certainly as he is
removed

removed into it, he never fails to feel the good effects of it, by the subsiding of the fever, and the almost total removal of all the consequent complaints with which he was so much oppressed.

AND here I cannot help observing, that there is perhaps no agent so effectual and expeditious in keeping down the fever, and cooling the whole mass of matter of which the body is composed, as this ventilation by an exposure to the air in gentle motion, more efficacious than refrigerating fluids taken into the stomach, as they soon acquire the heat of the body; for that portion of the circumambient air which is in contact with the body, and which, in a quiet state, would be gradually warmed by the heat of it,
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is momentarily brushed off by continued successive applications of fresh and cold air to the surface: this we sensibly perceive in the familiar experiment of the common fan. At first sight, indeed, the censures past on Mr. Sutton's conduct by the judicious part of mankind, for indiscriminately exposing all subjects equally, whether the tender or those brought up hardily, even to the severities of the weather, seemed to be very rationally founded; for it was natural to suppose that the delicate might frequently increase the original disease by the superadded mischiefs of a cold. However, this criticism, though familiar to every body's mouth, is more plausible than true; for when a fever is once begun, be it natural or artificial, either from the
constitution

constitution or inebriation, the perspiration is not subject to those suppressions which we suppose productive of the disorder we call a cold; and I believe, on recollection, we shall scarcely remember an instance of it under the actual duration of the fever, whatever might be its cause.

FROM the time the eruption makes its appearance, the fever begins to subside; and when the former is complete, that is, when the variolous fever has assimilated into the nature of the variolous poison such juices of the constitution as are, with that degree of fever, so convertible, the febrile process ceases.

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IN this state of the disease, however, when the interesting period is over, and the issue of the disorder is apparently secure; if yet, by injudicious management, the variolous fever is revived, be it by heating medicines, animal food, or vinous liquors, we sometimes see, in opposition to the idea of the pre-existing morbid miasmata, that *more* pocky matter is formed by it, and a great number of pustules produced, which would never have existed but for this cause, and without which there was every reason to conclude the former eruption completely critical. Many instances of this sort I have seen myself; and though I am sure they must frequently have occurred to practitioners in this business, yet, in order to put it beyond a doubt that

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that the eruptive fever has this property of generating or increasing the pocky matter, I will relate a case communicated to me by the physician concerned, and the lady herself, when she soon after became my patient, which I think must seal up our opinion of this matter.

Mrs. H---n, a lady in this neighbourhood, was some years since inoculated by Mr. Sutton; and as she was a woman of fortune, and exceedingly fearful, prevailed upon him, by a very considerable fee, to reside in the house during the whole process. The infection took place; the eruptive fever began, and, in a very moderate manner, continuing the usual time, was succeeded by a kindly number of pustules;

tules; on the complete eruption of which, the fever totally vanished, and all solicitude for the issue of the disease was at an end. The pustules, however, being few in number, though very fair and large, were not sufficient to quiet the lady's scruples; and indeed we frequently find it very difficult to calm the patient's fears on one hand, and to gratify their wishes on the other. And this lady, it seems, did not believe, or at least thought she could not be sure, that the constitution would be so thoroughly freed from the variolous poison by so moderate an eruption, as to be secure from future infection, or the mischiefs of an imperfect crisis. These fears the lady expressed while sitting at table with Mr. Sutton, *three days* after the

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small-pox had made their appearance, and the *eruptive fever* had, in appearance, *totally* ceased. The latent embers of the variolous fever were not, however, so entirely extinguished, as to be past rekindling. Mr. Sutton told her, that if she much wished to have a greater number of pustules, there was a certain way of procuring herself that satisfaction ; as she had nothing to do but to dine upon the hare, then on the table, and to drink a glass of wine. She accordingly pursued the hint, eat of the hare, and drank a glass of wine. Some hours after she grew hot and feverish ; her head ached and throbbed exceedingly ; and, after a very restless night, the next morning discovered the whole surface of her body covered over with ten thousand.

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land eruptions ; so thick indeed, that there were scarcely any intervals.

NOT only the patient, but the doctor was now alarmed ; and he could not help expressing his fears, by desiring that a physician might be sent for, as he would not undertake the conduct of so formidable a disease. Dr. Calwell was accordingly called in, to whom Mr. Sutton discovered the most anxious concern for the fate of his patient ; of which indeed he could not give a stronger proof, than that of making a sacrifice of his interest to his humanity, by disclosing to the physician the nature of the preparative medicines which he had given ; as he did not know, he said, but that an information of that sort might be ne-

cessary to determine his practice. He confessed she had taken nothing but calomel and antimonial preparations; told him the cause of this alarm; and added, that though he very well knew how to conduct a patient through the process of inoculation, he did not however pretend to any particular knowledge in the natural small-pox, or chuse to trust to his own judgment in so alarming a state of the disease.

THE small-pox, though exceedingly numerous, was yet of the distinct kind; the symptomatic febrile exacerbations, in the progress of the disease, were occasionally calmed by the evening anodyne; and no secondary fever supervening, the lady passed through the disease in a more kindly way

way than could have been expected in those circumstances.

ON considering this case, can there be a doubt but that this second eruption, and the great quantity of variolous matter which made its appearance after the tranquillity re-established in the constitution, was not only wrought up, but actually generated by the rekindled fever. To what else should it be owing? The flesh-meat and wine could no more create this matter then, than it could have done it a month before or after; nor is it possible to suppose, that this second load of poison still remained in the habit after the first crisis, as there was not between the decline and re-

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vival of the fever a single symptom of such a poison in the constitution.

INDEED we see the same analogy in the peculiar specific nature of some other fevers. In a fit of the gout, for instance, there is sometimes a smart fever, always a feverish habit, accompanying it; and we scarcely know which is the primary disorder, the gouty matter, or the fever: however, if the former is supposed, the fever once begun certainly increases the poison.

EVERY gouty process may be divided into so many distinct paroxysms. After a feverish and very painful night, the patient will be ordinarily tolerably cool, his pulse calmed, and his pain very

very considerably abated in the morning: and again, on the approach of night, the never-failing feverish exacerbation will always produce a return of the gouty torment.

Now, after a kindly, but smart fit of the gout, which has perhaps lasted two or three months, and has visited, and at last taken a regular leave of all the extremities, with every appearance of a complete crisis; we shall very probably conclude with Dr. Cadogan, that the constitution is cleared up, the gouty matter which roused the fever fairly eliminated, and the blood or juices reinstated in their original purity; and that therefore a subsequent accumulation of gouty matter in a great measure depends upon our own conduct.

THIS is all very plausible; but the misfortune is, that actual experience stubbornly opposes this theory; for if this very patient, whose constitution is supposed to be thoroughly swept by the gouty process, should unfortunately take cold on his first appearance abroad, so that the feverish habit is generated anew, he shall be a second time seized with his gouty complaints, and be again tormented with a repetition of the same pains, which frequently do not terminate but with a fit as long and as obstinate as the former. Whence then comes this fresh accession of gouty matter? not from gradual accumulation surely; there has been no time or funds of irregularity for it; nor have we any reason to imagine (from the acknowledged regularity or complete

plete termination of the former fit) that this quantity was left in the habit.

THE same reasoning holds good in, and is confirmed by, many other fevers. To instance the miliary, in which every feverish relapse is constantly followed with a fresh crop of eruptions; and as the old method of conducting this disorder was that of keeping the skin constantly soaked in sweat, such an exquisite tenderness and sensibility to cold was superinduced in the reeking patient, that after the first fever subsided, it laid the foundation of repeated colds, with their successive fevers, and consequent eruptions, which were frequently not terminated but with the life of the patient.

FROM

matter, but by preventing the further and undue generation of it.

I CANNOT dismiss this part of my subject without just observing, how very extraordinary it is that a man of Dr. Sydenham's judgment, and possessed of a mind so well calculated for discovery, should not have carried his own convictions further into practice. He seems so thoroughly convinced of the utility of the exposure to cold in the small-pox, even in an advanced state of the disease, that he recommends it as the most certain, if not the only, way of restoring the swelling of the face when there has been a sudden recession of it. Nay, he further mentions an instance of a patient, who being apparently dead and laid out,
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was yet recovered by the cold. But notwithstanding all this, his principle no farther influenced his practice than in the instance above-mentioned, in recommending the patient only to no confinement in bed during the eruptive fever, and now and then ventilating the room with a little fresh, to brush off the foul diseased air. Perhaps, had not his practice been influenced and cramped by the dread of persecution from his antagonist, the famous champion for the warm regimen, Dr. Morton, he might have deprived Mr. Sutton of an honour which candour and impartiality must now acknowledge to be his due.

BUT to return from this long, tho',
I trust, not useless digression, (as it
affords

affords very considerable practical indications) and go on with the second general consideration, viz. the different tendency there is in the *same* body, at different times, to be poisoned by the variolous fomes.

AGREEABLY to what has been said, we find that, during the epidemic tendency, subjects not passed the distemper are more open to contagion than in other constitutions of air when the small-pox is not epidemic, and is consequently a rare disease. Instances are very common, where subjects, who have escaped infection even from inoculation, as well as many other means of contagion, yet, on removal into a situation where the small-pox has been epidemic, have presently after
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been seized with the disorder. Indeed events of this kind are so common, as to have given rise to a vulgar, but ill-grounded opinion, that any change of air is hazardous to those who have not passed the small-pox.

As, however, it is very certain that there is in the same subject, at different times, this different propensity to be poisoned; and as it is most probable also that this promptitude to infection is in proportion to the degrees of the variolous principle; I shall conclude this section by observing, that if the first-mentioned subject, viz. one of a highly enflamed constitution, should chance to be seized with the small-pox at the time that the constitution is unhappily ripe for
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the production of it, we may well suppose that this consideration, super-added to the former, at the same time that it produces a disease, formidable by all the concomitant symptoms of violent inflammation, will render it still more dangerous by a load of variolous matter. The small-pox may possibly be of the distinct kind, (for I apprehend the distinguishing character of the confluent depends upon another circumstance) but there is every reason to fear the patient will have a hard struggle for his life.

IN the second subject, viz. that of a putrid character at the time of infection, at the same time we are prepared to expect a train of deadly symptoms, such as flat and pale pustules

tules filled with an indigested sanies ; livid spots perhaps, and all the concomitants of a putrid dissolved state of blood ; we cannot, I say, be surpris'd to find his distress heightened by a habit saturated with variolous poison.

HAVING seen, in this second section, what effects a *propensity* to the disease, or a *disposition* in the body to be *poisoned* by the variolous fomes, may have upon the small-pox which is to be produced ; and how much the danger of the disease may be heightened by the *concurrence* of this principle with that malignity of the constitution which has been mentioned in the first article ; let us now consider how far the malady is still capable of aggravation by the third source of mischief, viz.

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THE *manner* in which the subject is infected, or the disease produced, either by accidental contagion or an epidemic influence.

DR. MEAD is of opinion, that the air of this climate never produces the plague, small-pox, or measles, as the two latter were never known in Europe till the Moors entered Spain; and that they were afterwards propagated and spread through all nations, chiefly by means of the war with the Saracens. Dr. Arbuthnot is of a contrary opinion: he, from a train of reasoning, concludes that the plague itself may be produced or generated by some malignant quality in the air, without any contagion.

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WHICH of these opinions is true, I will not take upon me to determine; but I cannot help remarking, that every species of contagious disorders must have had its origin or first existence from causes prior to all contagion, without which it could never have begun to be, or its original generation have been conceived. And as all these several disorders (particularly the small-pox and measles) do often rage violently in this climate, it is contrary to the analogy of nature to suppose that a constitution of things, so calculated as frequently to support them in full vigour, should not be capable of bringing them into being. Be this true or not, if those diseases are considered as exotics, and it is therefore concluded that they always produce

duce their effects in this climate by contagion; it is however most probable, if not quite certain, that this principle is sometimes so exceedingly languid and inefficacious, that it requires the agency of other causes to give it activity, so as to produce general effects, or the tribe of diseases to which it belongs, and which without this agency, therefore, would never again be brought forth.

INDEED it is not probable that the simple principle of contagion can exist, or be capable of producing active mischief, after remaining without effect for so great a length of time as it sometimes does; for we see large towns, and very considerable tracts of country, totally without the small-

pox, and that for a great while together ; at another time, we shall, without being able to trace any agency of contagion, see it begin to make its appearance, increase, and rage violently ; and then again gradually decline, though all the subjects for the disease are not infected ; and though the principles of contagion, which have acquired their utmost force and virulence, and might infect them, remain in houses, furniture, and many other fit repositories for the variolous poison.

FROM these considerations I think we may safely conclude, that though the strongest epidemic tendency may not in Europe generate or create this disease without the concurrence of a
contagious

INOCULATED SMALL-POX. 101

contagious fomes ; yet that there is by the agency of the former such an alteration made and propensity brought on in the animal juices, as is essentially necessary to continue the existence of the disease.

VARIOLOUS contagion, when it exerts its influence upon the subject of its operation, produces its effects by the actual application of its poison, either externally through the medium of the skin ; or internally to the gullet, stomach, and guts, in the act of deglutition ; or, lastly, to the lungs in the act of respiration.

THAT the pores of the skin are possessed of very considerable absorptive powers, analogous to those of

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DISSERTATION ON THE

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... answer for, is not unworthy of being
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THE captain of a West-Indiaman informed him that, in consequence of the misfortune of his ship's foundering at sea, he, and many of the crew, were obliged to take to their boat. Here they were exposed to the miserable alternative of drowning or starving. They remained in this situation many days, and several of the sailors were actually starved to death. When the captain grew feverish, and laboured under that insatiable thirst which is the usual attendant on such a state of inanition, recollecting to have read or heard that some in their circumstances had been relieved by dipping their cloaths in the water, and putting them on wet, he tried the experiment himself, and prevailed upon some of his companions to do the same. The

success of it was even beyond hopes; it refreshed them immediately, and very soon took off their pain, as they continued to repeat the experiment, did they suffer at a distance from that distressing situation. He observed that the cloathing was very fast, and that there was a considerable crust of salt formed on the surface of the body, which was scraped off as often as they rubbed themselves with wet cloaths. By this means they supported themselves, and they were wonderfully relieved from their distress by another ship which those wretches, who refused to use of this expedient, perished.

From this history it is very evident that water, perhaps pure element

copiously imbibed by the absorptive powers of the skin, and conveyed into the body in such a quantity, as to prevent the juices from growing acrimonious for want of dilution,⁴ and to carry off the fever which is necessarily brought on by that means: for this captain declared, that after he made use of the above-mentioned expedient, his spirits became chearful, and he felt not the least thirst.*

BUT though there may be a possible admission of the poisonous miasmata into the constitution through the skin from this principle of absorption, yet probably the poison very seldom exerts its influence upon the habit in this manner.

* This account was likewise published in one of the public papers.

manner. Possibly by a local and actual application of the gross matter lodged in the cloaths, or conveyed by the touch of a diseased patient, the distemper may sometimes be produced by a kind of inoculation, and then the disorder will probably be favourable; but when the poison, in a more diluted state, only floats in, or impregnates the air, I believe it seldom enters the pores of the skin, and poisons by the way of absorption; for the degrees of activity in which this power is exerted, are most probably in proportion to the aids the constitution may stand in need of from it.

In cases of great inanition, as in the instance of the persons just described, it is very probable, in that hungry
state

state of the constitution, when the demands of nature are not supplied by the ordinary channels; in this distressing state of things, I say, it is very probable that all the powers of animal life exert themselves to prevent the destruction of its being. And hence no bad argument may be drawn in support of the commonly received opinion, that very old people, sleeping with young ones, imbibe principles of life and renovation to a certain degree.

BUT whether this opinion be well founded or not, yet, as it is so much easier to imbibe sickness than health, those persons who are obliged to attend the sick in hospitals, &c. where the atmosphere is frequently loaded with floating putrid poison, would do well
to

to use the caution which this principle suggests, and, before they visit their patients, keep their vessels full by a previous hearty meal, and not plunge into such a diseased air when the absorptive powers of the constitution are active from a state of hunger and inanition.

BUT to return. It is more than probable, however, that the ordinary mode of infection is by the lungs, that important organ, so formed and calculated to administer and to convey to the constitution the benefit of all those salutary properties of the air that are so necessary to the purposes of animal life; and, for the same reason, but too capable of conveying to the blood the morbid particles of a contagious disease;

INOCULATED SMALL-POX. 109

disease ; which, from their structure, we may be very sure they are well calculated likewise to receive, to entangle, and to retain.

FOR the innumerable bronchial ramifications terminating in as many bladders, or vesicles, the sum of whose surfaces in a human subject have been found by calculation to exceed the external surface of the whole body ; and the lungs being likewise of a lax delicate texture, as well as of so extensive a surface, they cannot, on these accounts, but be extremely obnoxious to the influence of so active a poison as the variolous effluvia.

DR. MEAD is of opinion, and indeed it is now generally believed, that the
seeds

INOCULATED SMALL-POX. 111

poisonous particles in the act of expiration, cannot doubt of this organ's being perfectly qualified for entangling and retaining the mischief, as well as afterwards conveying it to the constitution.

It is possible too that the stomach may have the mischief applied to its surface by a conveyance of the poison with the saliva; but I believe this mode of infection is by no means so common as that by the lungs, that great medium of correspondence between the air and the animal œconomy.

Now, when either of these organs is first and particularly affected by the morbid fomes, there is the strongest reason

reason to suppose that those noble parts, together with the fauces, glottis, aspera arteria and œsophagus, will frequently labour under a greater load of pustules than the external surface of the body: for we observe, when the patient is infected artificially, that the parts to which the poison is applied suffer in a greater degree than the more distant; and that the circumjacent skin, to some extent, is pestered with pustules. Similar effects are produced also by simple contact, where a person, who has never passed the small-pox, lies in the same bed with children under the disorder. And on the same principle accordingly, in the natural small-pox, with which patients are most probably infected in the above manner, we frequently find, by the
hoarse

hoarse cough, difficulty of swallowing, soreness of the throat and breast, and by inspection of the throat and glottis, that these several parts before mentioned are actually loaded with pustules, and suffer very considerably from them in their state of inflammation.

FROM this particular application of the morbid matter to the fauces, throat, and lungs, I am persuaded the large discharge of saliva, &c. arises, which characterises the confluent small-pox, and which makes its appearance in grown subjects from the time the state of inflammation begins. The perpetual stimulus arising from the pustular, enflamed state, and painful condition of those parts, necessarily provokes a more than ordinary discharge

charge from the salivary glands, which thus affected become a considerable and useful outlet to the morbid matter. But as children never spit off the saliva secreted in the mouth, or what is coughed up from the lungs, but swallow both, in them it is therefore of course thrown off by a diarrhœa, which answers the purpose of the salivation in adults. It is, I say, most probable, therefore, that the characteristic symptoms of salivation in grown subjects, and the diarrhœa in children, arise from the above circumstance.

THE fever attending the small-pox, from the commencement to the termination of the disease, must always be considered as having two periods. That in which the patient is attacked
on.

INOCULATED SMALL-POX. 115

on the first notice of the disorder, is very properly termed the eruptive fever; and this ordinarily continues till the variolous matter in the constitution of the subject is wrought up, and the consequent eruption is finished.

IN the mild distinct small-pox, when the pustules are few, and happily distributed over the body, both within and without, in an equable and uniform manner; on the very first appearance of the pimples, the fever abates, and continues so to do as more pustules appear, till it totally ceases upon their complete eruption, which is ordinarily about the third or fourth day from their first appearance. After this, the feverish habit, which comes on as the pustules enflame and advance

to maturation, is merely symptomatic, and ordinarily so slight as to give no reason for apprehension, unless the pain and inflammation attending such a number of little abscesses are injudiciously heightened by the heat of the bed, or an improper regimen.†

WHEN the maturation of the pustules is fully completed, the inflammation at the base, with the consequent soreness, goes totally off; and the feverish habit then ceasing, the process of the disease is completely finished.

BUT

† This experience frequently evinces; for we often find that a fever, at first simply inflammatory, may, by excessive heat and rapid circulation, and the consequent injury to the crasis of the blood, be converted into one of a putrid character.

BUT this is not the case with the unhappy patient in the confluent small-pox, when the internal parts are invaded, indeed oppressed, with great numbers of pustules; there is then no interval between the eruptive and the subsequent symptomatic fever. The distressed feelings which the patient labours under from such a generally enflamed skin, heightened by the diseased condition of the *nobler parts*, perpetuates the first fever, which is of course increased by throbbing lancinating pains, as the parts invaded with the variolous poison advance in their state of inflammation.

HERE then, a large discharge from the salivary glands excepted, the only possibility of a happy termination to

so formidable a disease, seems to be founded on the hopes, that the *nobler organs* not being so far vitiated as to be rendered unfit for the purposes of life, the whole process of supuration, in every part of the body, internal as well as external, may possibly proceed uniformly; and having gone through as complete a maturation as the state of the constitution will admit, the fever may then subside and disappear. But, unhappily for the patient, this is frequently not the case; the continuing fever, the effort of oppressed nature, gives sufficient information, that all is not so well within as external appearances might otherwise have induced us to believe; but that the *nobler parts* are perhaps rendered even unfit for the purposes

INOCULATED SMALL-POX. FIG.

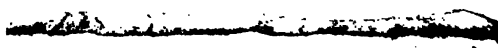
purposes of life ; at least, that labouring and lagging behind in the process, they have not kept pace with the apparent state of the disease on the surface of the body.

THIS I take to be the true and general cause of the *secondary fever* ; that formidable symptom, so frequently fatal in this species of the disease ; sometimes seen in the distinct natural small-pox, but scarcely ever in the inoculated subject.

I MUST here observe, that it is impossible the existence of this fever, or the cause of it, should be certainly known, till the process of the disease on the surface of the body is finished ; when we hope, indeed naturally expect,

pect, that the fever, kept up by the general apparent state of the inflammation should cease ; but in this state of the disorder, it is found by every symptom of diseased lungs, as well as by actual dissection, that patients, amidst those miserable circumstances, die peripneumonic.

HAVING seen the dreadful consequences which must frequently attend this mode of infection ; or, if I may be allowed the expression, inoculation by the lungs, we will close this *third section* by observing, that if superadded to the unhappy situation of the formerly described patients, we suppose them poisoned by the variolous fomes in this most pernicious manner ; and that, besides the immediate action of the
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the poison on this important organ, the first subject with all the powers of inflammation in an exalted state; and the second, with the misfortune of a putrescent state of blood; alike labour under a greater load of various matter (from that critical and unfavourable aptitude to the disease at the time in which they were supposed to be infected) than the constitution can struggle with; we cannot wonder that the disorder is aggravated, and the chance of life lessened by the superadded mischiefs of a secondary fever.

WE will now draw towards a conclusion of this melancholy subject, by considering how far the distress of an unhappy patient may be still wrought
up

up by the influence of the fourth and last article, namely,

THE malignant or putrescent state of the air, or constitution of external nature, at the *time* of infection.

THE importance, and indeed fatal effects of this principle, are so generally acknowledged and well understood, that little needs be said to enforce a conviction of the dreadful mischiefs it is likely to produce in a subject labouring under an epidemic small-pox, and particularly in those under the former supposed circumstances.

SYDENHAM, Mead, and many other writers of character, have judiciously

ciouſly remarked, that the plague itſelf loſes its terrors, becomes leſs formidable, and even mild, when the ſource of the diſeaſe is not aſſiſted by this principle. Whether this conſtitution of external nature produces its deleterious effects by heightening the natural malignity of the infecting poiſon, by rendering it more actively contagious, and communicating it, in a ſublimated ſtate of malignity, to the juices of the conſtitution, before ſuppoſed ſound and healthy; or whether this unfriendly ſtate of the air acts upon the conſtitution itſelf in ſuch a manner as to diſpoſe the blood and humours to putrefaction, rendering the effects of contagion, by this preparation for its deadly miſchief, more peculiarly fatal; which ever of theſe opinions

opinions is true, (though I am inclined to believe them both well founded) the consequence of this indisposition in external nature, and its terrible effects upon the human body, are just the same.

THE two general characters of a morbid state of air, are the putrid, and inflammatory ; and we uniformly observe, whenever any one is attacked with a fever under either of those prevailing dispositions, that it never fails to impress its character upon the disease.

WHEN the angina maligna made its first appearance in the western part of this kingdom, about thirty years since, its effects were, for the first year or two,

two, as deadly, and frequently as sudden too, as those of the plague. I saw several instances, where the disease, even after it was well understood, (laughing, nevertheless, every medicinal effort to scorn) destroyed the patient in thirty hours. The subjects of this disease were those of a tender constitution, chiefly children, and women of a delicate habit; yet while the malignant constitution of the air continued to support the virulence of the disease, almost all who were seized with fevers, either from colds, intemperance, or any other cause, discovered evident symptoms of a putrid tendency.

I VERY well remember, when the malignant fore throat first raged in this town, I refused to inoculate several

ral persons who applied to me, one particularly, who came on purpose from a considerable distance; and upon this principle, viz. the great reason there was to fear that the predominant disposition, then subsisting, to putrefaction, might impress that character on the variolous fever. And indeed the truth of this apprehension was too well proved by a well-known instance, viz. that of two children of a gentleman in this town, who being inoculated under that prevailing influence, both died, with all the symptoms attending a putrid fever.

As it is therefore unnecessary further to enforce a truth so very evident, and indeed generally acknowledged, I shall only avail myself of the efficiency
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of this principle, as the fourth and last cause of mischief; and observe, that if a patient, of either of the two before described habits, could be supposed to have his calamity heightened, it would be so by this prevailing malignant tendency, which, by uniting its baneful influence with that of the other sources of his misery, would produce a train of the most mortal symptoms, viz. petechiæ, black pustules, and partial mortifications; leakages of a dissolved blood through the rotten vessels, and at times, perhaps, an universal necrosis. In short, from the combination of so many engines of mischief, we cannot be surprised at a small-pox as deadly as the plague itself.

As,

As, I think, we have shewn what was first intended, that the influence of one or more of these four principles under consideration is capable of producing that variety we see in the disease ; and that from the union of them all will result a natural small-pox, complicated with all those horrors we too frequently meet with in it : having, I say, established the truth and consequence of those principles, and being now therefore furnished with materials to solve the problem we originally proposed, viz. to account for the difference between the natural and artificial small-pox ; let us turn aside from this melancholy scene of human misery, to the pleasing consideration of that inestimable discovery with which Providence has blessed the world,

world, and by which this formidable disease, quite disarmed of its terrors, is rendered mild and gentle ; and, perhaps, in general, less hazardous than a common cold.

I SHALL now proceed therefore with a short kind of recapitulation in the order observed before, and see how far the *inoculated patient* is influenced by, or rather exempted from, those four sources of mischief.

FIRST, The patient's *constitution*.

INOCULATED subjects then are infected with the disease (if children, at a time when they are not susceptible of fear ; always, however, if the process is conducted with prudence) when

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the constitution of the patient, is in the best condition to combat with the disease; viz. when by restrained diet, and proper purgatives, all accidental incitement to inflammation is prevented; a tranquillity in the animal œconomy is superinduced; and every load or incumbrance by which the habit may be oppressed, removed; and in young subjects more especially, any worms which may be lodged in the bowels, discharged.

SECONDLY, The *propensity* of the subject to be *poisoned* by the variolous fomes.

THE disease, in the inoculated subject, is *forced* on intentionally; and as it has been shewn that the propensity

penity to it differs at different times in the *same* subject, there is the greatest reason to suppose that the disorder is produced, if I may so express myself, by downright violence, when there subsists in the patient but little of that *peculiarity* of constitution so essential to the production of the disease, and so *general* when the small-pox is epidemic; or, in other words, when the body is indisposed to be poisoned. This consideration, peculiar to the disease when artificially produced, I am persuaded, is the true cause of the small quantity of pocky matter (and that general scarcity of pustules, when compared to the natural small-pox) which has ever accompanied inoculation, and is one of the grand advantages of the discovery. Superadded

to this consideration, by the modern practice of exposure to cold, the violence of the eruptive fever is so far moderated and kept under, as to prevent its forming an additional quantity of variolous matter, which, in a violent and unrestrained state, it would do by assimilating the juices of the constitution into the nature of the variolous poison.

THIRDLY, The *manner* or *mode* of communicating the infection.

WE have already shewn the importance of this consideration in the natural infection, where the patient is ordinarily poisoned through the medium of the lungs. By inoculation, the subject is infected by an application
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of the virus to the external surface of the body, which can therefore produce its mischiefs to the habit no way but through the medium of the skin; so that the whole constitution (excepting the part immediately surrounding the wound) being affected uniformly by an equable dissemination of the pustules, though the patient should have them pretty freely scattered, yet the process of the disease is regularly carried on; and the noble parts within, not being particularly affected by a partial application of the variolous fomes to their surfaces, nor being oppressed by at most more than a common share, have no distress to proclaim by a *secondary fever*, which is therefore scarcely ever seen in inoculated patients.

FOURTHLY, and lastly; The *constitution* of the air at the *time* of infection.

No cautious and judicious practitioner would ever chuse, when there was an epidemic, malignant influence in the air, to expose his patient to the pernicious effects of it, and to stamp its baneful character upon his disorder, by inoculating during such a state of things; but would most certainly make choice of that season when its disposition, and temperature likewise, were best calculated for the purpose; consequently, we rarely see the ill effects of this principle in the artificial disease.

FROM this view then of the *inoculated* and *natural* patient, and furnished with

with those indubitable and important principles arising from it, we see with certainty (which is what I proposed to investigate in this Dissertation) to what the grand success of inoculation is owing; and that the manifest difference between the natural and artificial disease arises, *not from any particular secret, trick or mode of physical management, but from a happy and necessary concurrence of important circumstances in favour of the inoculated subject; namely, the absence of all those mischievous agencies to which a patient under the small-pox, in a way of nature, is unfortunately exposed.*

NOTWITHSTANDING all the advantages which inoculation necessarily enjoys, it may, and necessarily does,

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sometimes though rarely happen, that an unfortunate patient is now and then by chance inoculated at a time when the constitution is in a high disposition to be poisoned, and almost ripe for a spontaneous production of the disease; and when, likewise, by some undiscoverable indisposition, the crasis of the blood is broken, or the fluids in an acrimonious state. But even then, though the small-pox may be of an untoward kind, yet by the *manner* of infecting the patient, the nobler parts not being *particularly oppressed*, he will seldom have his calamity increased by the additional danger of a secondary fever.

I SHALL detain the reader very little longer, only adding a practical remark
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or two (arising from the foregoing considerations) on the two disorders.

FROM the great advantages which arise from exposure to the cool influence of the air during the eruptive fever in the artificial, we may infer its use in the natural small-pox; there being no reason why it should afford so salutary an aid in the one case, and not in the other. And indeed I have known it actually attended with very great advantages. Even in the confluent small-pox I have seen patients daily exposed to the open air, from the commencement of the disease to its conclusion, with evident good success. Even after they have been entirely blind from the swelling of the face, they have been led about a garden

den during the day in a mild season; and from experiencing the constant advantages of that treatment, have dreaded the approach of bed-time, and accordingly waited for the morning with the greatest anxiety and impatience; the disease being all the while accompanied in its progress with the most kindly symptoms that the degree of it would admit, and terminating happily. Nor is this to be wondered at, if we divest ourselves of prejudice. Would any surgeon increase the symptomatic fever of his patient by the heat of the bed, during the suppurative process of an abscess? Whoever considers the throbbing pain a person suffers from an inconsiderable rising on his finger, when it is kept hot under the bed-cloaths, can never be

be surprized at the distress felt from the same circumstances by one who has thousands of little abcesses all over his body, a great part of which suffer at the same time the additional uneasiness of pressure. Indeed, were it not for the kindly and stupifying effects attending the charitable evening anodyne, which blunts the feelings of nature, the common practice of confinement in bed would, by the increase of the symptomatic fever, prove more destructive than it generally does. The cool refreshing air, therefore, which first curbs, and in some measure quenches the *eruptive*, afterwards moderates the *symptomatic fever*, by preventing the aggravation of those principles which caused it.

FURTHER;

FURTHER; as we have reason to believe, from the practice of inoculation, that, in full habits, the violence of the eruptive fever, and the disposition to inflammation, is safely lessened by purging, at least by emptying the intestines; this practice ought never to be omitted in the natural small-pox, to which, in fact, it has been often applied with manifest good success in that state of the disease.

I FEAR inoculation furnishes us with no other certain indications or rules of practice that may be advantageously transferred to the natural small-pox; we will now, therefore, see whether any cautious, or practical precepts, can be drawn from the consideration of the natural disease, and usefully applied

applied to inoculation, in order if possible to render it still more secure than it is already.

It has been proved by reasoning, grounded on indisputable observation, that the variolous principle in the same subject is different at different times; that it is sometimes more, at others less, suffering a kind of ebb and flow; or, in other words, that the body has at different times a greater or less propensity to be poisoned. And it has likewise been shewn, that there is the highest reason to suppose this propensity to be greatest when there is an epidemic constitution of the air, which favours the production of the disease. If this be true, and it be likewise highly probable that the
severity

severity or mildness of the disease depends in a good measure upon the greater or less propensity of the subject to be infected with it, it would not certainly (as has been formerly hinted) be an eligible time to bring on the disorder by inoculation during the continuance of an evidently prevailing tendency to the disease, as there is great reason to fear that the intended patient is in this case but too much disposed to a spontaneous production of it, and therefore likely to be deprived of one of the great advantages of the artificial disease. Prudence would therefore direct us to *take advantage* of the *absence* of such a prevailing tendency, when *all* the benefits of inoculation may be *secured*, and not *delay* the operation till *such* a constitution

INOCULATED SMALL-POX. 143

tution of air prevails, as at once to make the operation necessary, and to deprive it of some of its advantages.

BUT the misfortune is, that though the epidemic constitution, above-mentioned, is not an eligible time for performing the operation, it is sometimes scarcely possible to avoid it, though I have always yielded with reluctance; for people's fears, arising from the misfortunes of their neighbours, drive them to seek security in inoculation; and this too in the case of infants, where the risk is greatest, for they are always exposed to more than common hazard, from circumstances necessarily connected with their time of life; and there is certainly a greater loss of inoculated patients under two
years

144 A DISSERTATION ON THE

years, than of all ages between that and threescore. All that can be said, however, in such circumstances, is, that one consideration must balance another; and if the patient cannot be removed from infection, and the risque of it is very great, it will become reasonable to give him all the advantages of inoculation that can be then had, and to perform the operation even under those disadvantages.

P O S T-

POSTSCRIPT.

It was my intention to have confined myself entirely to the subject of the foregoing investigation, without animadverting on a mode of operating, at present so well and generally understood; or pretending to propose any improvement upon it. But as the methods now in use sometimes, and indeed not unfrequently, disappoint the expectations of both the operator and patient, by failing to communicate the infection, I hope to be excused, if, in few words, I describe a method I have myself used for some time past, which has entirely exempted me from this inconvenience, and which the practitioner may, or may not, adopt,

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as

as he pleases. If the description, however, should appear unnecessarily minute and particular to men of experience, I shall trust my apology to the younger part of the profession, who will not, perhaps, complain of too much precision.

THE two methods in general use are, either to insinuate the point of the prepared lancet just under the cuticle, and by that means, without drawing blood, to apply the virus to the true skin, and consequently to the extremities of the nerves and blood-vessels; or otherwise, with the point of the lancet to produce the same effect, by a very small superficial scratch. Both these methods, it is well known, sometimes fail, and disappoint the intention.

IN

IN the first manner of inoculating, the extreme thinness of the cuticle in that part of the arm on which the operation is usually performed, renders it very often scarcely possible to convey the poison under the skin without drawing blood, which may even wash the virus quite off, or at least so far dilute it, as to render the operation ineffectual. Or, if the operator is dexterous enough (which, however, in the cases of young children, is exceedingly difficult) to introduce the instrument fairly between the two skins, it may then happen that the virus, (especially if in a moist state) having, in the moment of operation, been accidentally forced back from the point of the lancet, shall not be inserted at all.

THE second method of operating, though by a slight scratch, may also, by drawing blood, be attended with the same uncertainty.

HOWEVER, whether the reasons above assigned are, or are not, the real causes of accidental failure, certain it is, that both those methods are subject to it; and also, that disappointments of this sort are always disagreeable, and sometimes even embarrassing to the operator and patient.

THE following method is that which I have successfully used a considerable time, without having failed of infecting the arm in a single instance.

HAVING formed a quill like those belonging to camels hair pencils, a
small

small piece of very soft sponge is driven into it, till part of the sponge is pushed quite through, so as to form a little papillary protuberance, about the size of a small hemp-seed; at least it may be cut into that size and shape with a pair of scissors. The operator may, if he pleases, be provided with half a dozen of those implements, which will be necessary if a number of patients are to be inoculated; the sponges of all which may be saturated by the matter of two or three ordinary sized pustules.

HAVING then such an armed sponge ready, the arm of the patient should be grasped underneath by the hand of the operator, so that his fingers and thumb on either side may put the
skin

skin on the upper part of the arm upon the stretch. Then with the point of a lancet, or some such instrument, make two (least one should fail) very slight incisions, about the tenth of an inch long ; and so very superficial, by several very tender and cautious touches, that the cuticle being but just cut through, the bottom of the scratch may appear but barely red, without bleeding ; then, with the skin still on the stretch, rub the armed sponge on the wounds, till you are sure the poison is intimately applied to them. After the incisions are made, it will be proper however to wait some little time, in order to observe whether they are likely to bleed ; for we frequently meet with subjects, particularly those of a florid complexion, and plethoric habit,

habit, where the scarf-skin is so exceedingly thin, that it is scarcely possible by the most cautious touches to divide it without drawing blood ; if that happens to be the case, the blood should be repeatedly wiped off till it intirely stops, before the virus is applied. If the matter has been taken off any time, so that the sponge is become dry and hard, this loss by evaporation may be readily supplied by very slightly moistening the sponge with water at the time of using it.

I have myself used an instrument for some years past, which I think is more convenient for the purpose of inoculation than a common lancet, both because it is better held by the operator, and because the whole apparatus,

paratus, sponge and lancet, make but one instrument.

IN a small pencil-case, open at both ends, are contained the little lancet, and socket for the sponge, so fixed at the contrary ends of a metal cylinder, as by the sliding of it backwards and forwards, to offer themselves successively for use. It is, perhaps, unnecessary to say, that one of these little armed sponges will be sufficient for five or six patients.

FOR the sake of those who may choose to adopt this mode of operating, and wish therefore to be furnished with an instrument of this sort, I have annexed a drawing of it.

FINIS.



(a) THE INSTRUMENT with the lancet and sponge exposed at the different ends. When both of these are concealed, the sliding ring (*b*) is consequently then in the middle of the case; and by giving it a small turn, the screw-pin may be made to fall into the notch (*c*), so as to secure the lancet and sponge from injury in the pocket by accidental exposure.

(d) A quill and sponge.



Phil. Edge. Pen.

(a) **THE INSTRUMENT** with the lancet and sponge exposed at the different ends. When both of these are concealed, the sliding ring (*b*) is consequently then in the middle of the case; and by giving it a small turn, the screw-pin may be made to fall into the notch (*c*), so as to secure the lancet and sponge from injury in the pocket by accidental exposure.

(d) A quill and sponge.



The Eagle Pen Co.

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(d) A quill and sponge.



W. L. & Co. Pen Co.









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Philippine Pen Co.

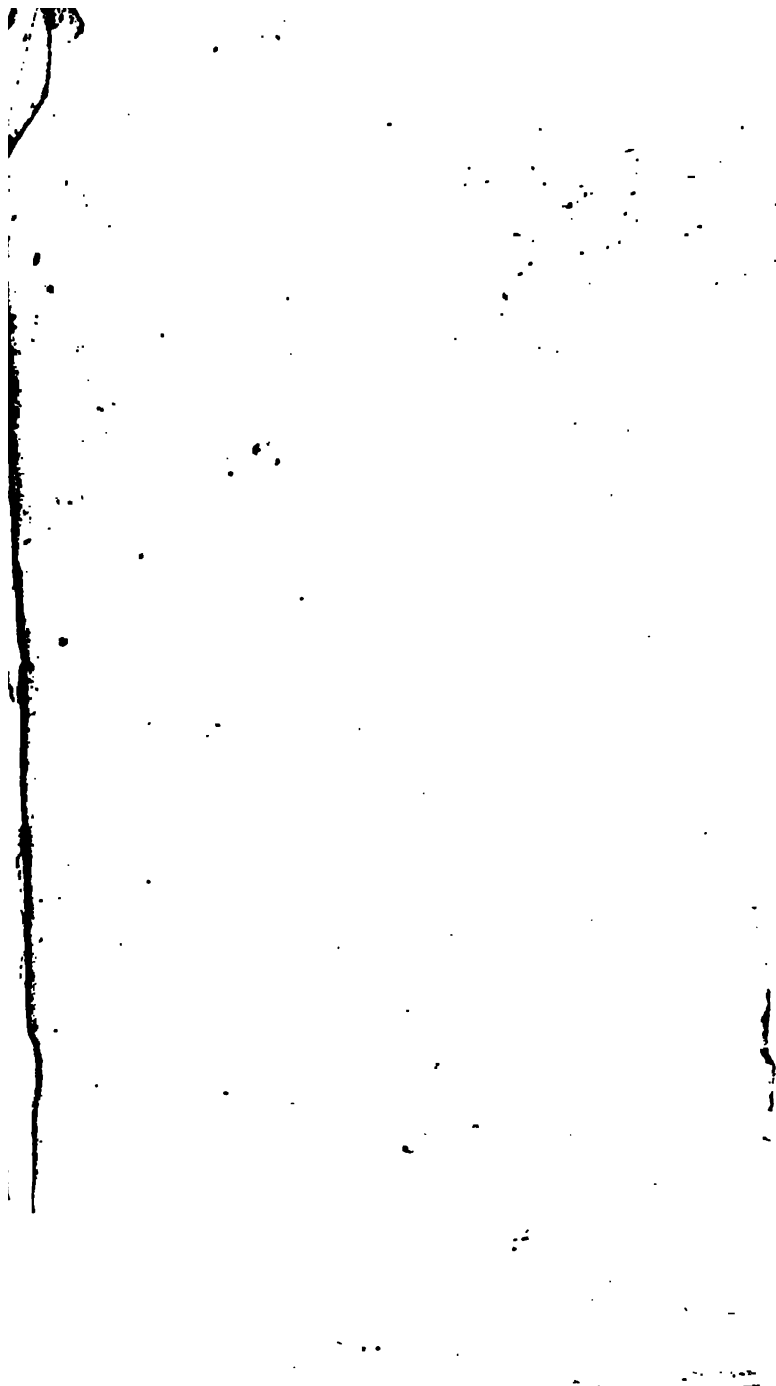
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